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And the other terms

are $7.\ \frac{41}{29}.\ \frac{239}{169}.\ \frac{1393}{985}$ &c.

To find $\frac{b}{c}$ ſuch as makes $bb - 1 = acc$, *i. e.* $acc + 1 = \square bb$, recourſe muſt be had to Lord Brouncker's method in Dr. Wallis's *Commercium Epiſtolicum*.

LVII. *Obſervations upon the* Electricity *of the* Air, *made at the* Chateau de Maintenon, *during the Months of* June, July, *and* October, 1753; *being Part of a Letter from the Abbé* Mazeas, *F.R.S. to the Rev.* Stephen Hales, *D. D. F. R. S. Tranſlated from the* French *by* James Parſons, *M. D. F. R. S.*

SIR,

Read Dec. 20, 1753. BEING aſſured, that the electricity of the atmoſphere would yet afford means of entertaining you, I ſpent part of this ſummer in obſerving what nature preſented me upon ſo important a ſubject.

On the 14th of June I accompanied the Marechal de Noailles to his caſtle of Maintenon. At my arrival, I ſet up an apparatus, which conſiſted of an iron wire 370 feet long, raiſed to 90 feet above the horizon. It came down from a very high room in the caſtle, where it was faſtened to a ſilken cord ſix

feet long, and was carried from thence to the ſteeple of the town; where it was likewiſe faſten'd to another ſilken cord of eight feet long, and ſhelter'd from rain: and a large key was ſuſpended by the end of this wire, in order to receive the electrical fluid.

Obſervation 1.

From the 17th of June, the time of beginning my experiments, the electricity of the air was ſenſibly felt every day, from ſun-riſe, to 7 or 8 in the evening; except in moiſt weather, when I could perceive no ſigns of electricity. In dry weather, the wire attracted minute bodies, at no greater diſtance than three or four lines. I repeated the experiment carefully every day, and conſtantly obſerved, that, in weather void of ſtorms, the electricity of a piece of ſealing-wax of two inches long was above twice as ſtrong as that of the air. This obſervation inclines me to conclude, that, in weather of equal dryneſs, the electricity of the air is always equal.

Obſ. 2.

When I graſped the wire cloſely in my hand, the electricity ceaſed inſtantly, and did not recover till three or four minutes after: whereas, during a ſtorm, we could deprive the wire of its electricity but a moment; for it immediately return'd with the ſame vigour. Whence it appears, that the common electricity of the air has but a ſlow motion.

Obſ. 3.

I endeavoured to increaſe the electricity of my wire, by the addition of a ſecond, which communicated with

with an electrical magazine, compoſed of pieces of iron, tin plates, gilt paper, and ſuch-like, ſuſtained by ſilken cords; and I obſerved, 1. That the electrical fluid did not even then act with any more ſtrength upon minute bodies preſented to the wire. 2. That, in depriving this magazine of its electricity, it ſeem'd to return the more ſlowly, the more conſiderable the magazine was; whereas the contrary happens during a ſtorm. This ſlowneſs, with which the common electricity of the air is propagated, makes me deſpair of finding means capable of rendering its motion ſenſible.

Obſ. 4.

It does not appear to me, that hurricanes and tempeſts increaſe the electricity of the air, when they are not accompanied with thunder: for, during three days of a very violent continual wind in the month of July, we were obliged to put the duſt within four or five lines of the conductor, before any ſenſible attraction could be perceived. The direction of the winds, whether eaſt, weſt, north, or ſouth, does not make any ſenſible alteration in the electricity of the air, except when they are moiſt. In the moſt dry nights of this ſummer, I could obſerve no ſigns of electricity in the air; but it returned in the morning, as I have ſaid, when the ſun began to appear above the horizon, and vaniſhed again in the evening, about half an hour after ſun-ſet. The ſtrongeſt common electricity of the atmoſphere, during this ſummer, was perceived in the month of July, on a very dry day, the heavens being very clear, and the ſun extremely hot. The diſtance of ten or twelve lines

was then ſufficient for the approach of the duſt to the conductor, in order to ſee the particles riſe in a vertical direction, like the filings of iron on the application of a magnet.

Obſ. 5.

On the 27th of June, at 2 afternoon, I perceived ſome ſtormy clouds riſing above the horizon, and immediately went up to my apparatus; and having applied the duſt to the key, it was attracted with a force, which increaſed in proportion as the clouds reached the zenith. When they had come nearly over the wire, the duſt was ſo impetuouſly repell'd, as to be intirely ſcatter'd from the paper. I drew conſiderable ſparks from it, altho' there was neither thunder nor lightning. Theſe ſparks were of a very lively red colour, when I attracted them with my finger: they were white and ſmaller, when I uſed a wire hafted in a glaſs tube: they were bluiſh, and much extended, when attracted by ſpirit of wine in a ſilver ſpoon.

Obſ. 6.

I applied a piece of reſin to the conductor, but could draw no ſparks from it: however, all, who were preſent, heard a noiſe like that of hairs when burnt. It was the ſame with ſealing-wax, woolen-cloth, linen, *&c.* Then I took a quickſilver'd glaſs, and applied to the clean ſide a piece of wire of ſix inches long, whilſt the other end was put to the conductor; by which I drew a multitude of ſmall whitiſh ſparks, which ſoon ceaſed, but were ſucceeded by a noiſe

noiſe, like that which happen'd upon applying the reſin to the conductor.

I imagine, that this noiſe proceeds from the violent efforts made by the electrical fluid, in order to penetrate into the wire. Since that fluid has only a determined ſpace to occupy in it, it is natural to think, that when that ſpace is fill'd, the fluid ought to produce a noiſe like that, which is heard, when the bottle in the Leyden experiment is greatly charged.

When I applied the end of the wire to the ſilver'd ſurface of the glaſs, whilſt the other end touched the conductor, the quickſilver affected me ſo ſtrongly, that, notwithſtanding my being ſo much accuſtomed to ſuffer theſe electrical ſhocks, I was not able to bear this.

From hence I conclude, that the beſt method of increaſing the electrical power is to make it fall upon ſome metalline ſurface, intimately connected with a ſurface, that is an electric *per ſe*. And in order to bring reaſon and experience together, this is the manner, in which I think the power augmented:

When the electrical fluid is puſhed with rapidity along the conductor (as it happens during a thunder-ſtorm), it ought to be inſtantly diffuſed over the ſurface of the quickſilver. This fluid communicating with the glaſs more eaſily than with the air (which we ſhall prove by-and-by), it ought partly to enter into the ſubſtance of the glaſs: for the difficulty, which it finds in paſſing through its pores, gives it time to accumulate, and conſequently to ſhock bodies applied to it with the greater power. But this method, which ſeems ſo convenient to increaſe the force of the

the electrical fluid in a ſtorm, never ſucceeded for the common electricity of the air. I always found it nearly extinct, never exerting itſelf beyond a certain ſphere of action, and that very inconſiderable.

Obſ. 7.

When the ſtormy clouds were in the zenith of my wire, I obſerved, that the electricity was increaſed to ſo high a point, that the ſilken thread attracted light bodies at the diſtance of ſeven or eight inches. This cord was ſix feet long, and in the firſt foot the electricity was nearly as ſtrong as in the wire, but from thence it diminiſhed in the reſt of the length. I ſubſtituted a glaſs tube to the ſilken cord, and obſerved the ſame phænomenon, with this difference, that the electrical fluid penetrated it with greater difficulty.

Obſ. 8.

The ſtormy clouds, which I mentioned before, remained about two hours above the horizon, without either thunder or lightning; nor did a very heavy rain diminiſh the electricity, except about the end, when the clouds began to be diſſipated; and for that time I left my apparatus.

About ſix o' clock in the evening I was told, that there were ſigns of a new ſtorm in the air: I went up, and while I was preparing matters, a young man of the town, thirty-five years old, ſubject to an epilepſy, was among the ſpectators. The ſmall time, which the ſtorm laſted, was not enough to make many trials in; and the following was what I moſt attended to:

I drew

I drew ſparks upon the epileptic perſon, who was preſent, from the firſt thunder-clap. At firſt he bore them; but in two or three minutes I perceived his countenance change; and, for fear that any accident ſhould happen to him, I begg'd he would retire. He was no ſooner returned home, than his ſenſes fail'd him, and he was ſeized with a moſt violent fit. His convulſions were taken off with ſpirit of hartſhorn; but his reaſon did not return in an hour and half. He went up-and-down-ſtairs, like one who walks in his ſleep, without ſpeaking or knowing any perſon, ſettling his papers, taking ſnuff, and offering chairs to all that came in. When he was ſpoken to, he pronounced inarticulate words, which had no connexion of ſenſe.

When this poor man recovered his reaſon, he fell into another fit. His friends told me, that he was more affected with this diſtemper when it thunder'd, than at any other time; and that if at any time it happen'd, which it rarely did, that he then eſcaped, his eyes, his countenance, and the confuſion of his expreſſions, ſufficiently demonſtrated the weakneſs of his reaſon.

The next day I learned from himſelf, that the fear of thunder was not the cauſe of his diſeaſe; but that, however, he found a fatal connexion between phænomenon and that diſtemper, with which Providence was pleaſed to afflict him. He added, that, when the fit ſeized him, he perceived a vapour riſing in his breaſt, with ſo much rapidity, that he loſt all his ſenſes, before he could call for help.

Such are the obſervations, Sir, which my moments of leiſure ſuffer'd me to make: I ſhould have been very

very glad, if the matter were more thoroughly examined, and my reſearches more worthy of being preſented to you: but you are better acquainted with nature than any body, and you well know how difficult it is to follow her in her operations. As to the reſt, I ſhall think myſelf well rewarded for my trouble, if ſhe more frequently gives me the pleaſure of amuſing you.

I have the honour to be, with a ſincere and reſpectful attachment,

SIR,

Your moſt humble and

obedient ſervant,

W. Mazeas.

END of PART I.